

Intel 22 nm FinFET Low Power (22FFL) Technology: FinFET Technology for the Mainstream

Intel has been manufacturing 22 nm FinFETs in high volume since the introduction of its Ivy Bridge processor in 2011, and its second-generation 14 nm FinFETs started high-volume manufacturing with the introduction of the Broadwell processor in 2014. Building on these years of 22 nm/14 nm manufacturing experience, Intel is introducing a new process named 22FFL (FinFET Low Power). This new process offers a blend of high-performance and ultralow-power transistors combined with simplified interconnects and simpler design rules to deliver a versatile FinFET design platform for low-power and mobile products.

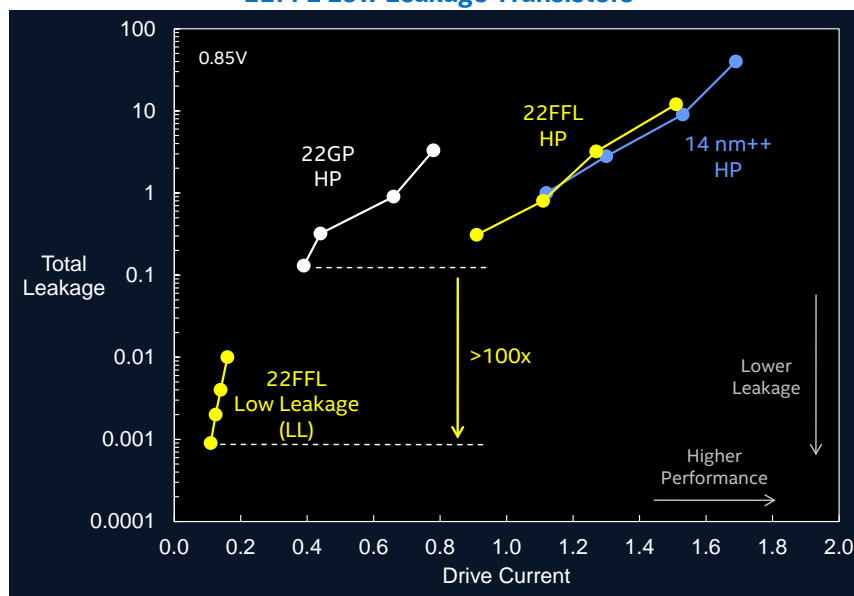
22FFL Dimensions

	22 nm	22FFL	14 nm	
Transistor	FinFET	FinFET	FinFET	
Fin Pitch	60	45	42	nm
Gate Pitch	90	108	70	nm
Metal Pitch	80	90	52	nm
Logic Cell Ht	840	630	399	nm
Trans. Density	15.3	18.8	37.5	MTr/mm ²
SRAM Cell	.092	.088	.050	um ²

22FFL is based on proven 22 nm and 14 nm features

The new 22FFL technology offers up to 100x lower leakage compared with the previous 22GP (general purpose) technology. The 22FFL process also delivers drive currents on par with Intel's 14 nm transistors while delivering better area scaling than industry 28 nm/22 nm planar technologies.

22FFL Low Leakage Transistors



22FFL provides the lowest leakage transistors on a mainstream technology

The 22FFL process includes a full RF kit with a wide range of advanced analog and RF devices to enable highly integrated products. Extensive use of single patterning and simplified design rules make this an affordable, easy-to-use design platform for a broad range of products that is cost competitive with industry 28 nm processes.

22FFL Devices:

- High-performance transistors
- Ultra low-leakage transistors
- Analog transistors
- High-voltage I/O transistors
- High-voltage power transistors
- Good device matching
- Low 1/F noise
- Deep N-well isolation
- Precision resistor
- MIM capacitor
- High-resistance substrate
- High-Q inductors

Intel has delivered more than 7 million FinFET wafers to date and the 22FFL process leverages all of that manufacturing experience to deliver exceptionally high yield.

Intel Custom Foundry offers the 22FFL process to customers through a platform that includes broad silicon-validated IP portfolios and fully integrated turnkey foundry services and support.

22FFL Technology

High-Performance Transistors:	High drive currents similar to 14 nm
Low-Leakage Transistors:	100x lower total leakage than Intel 22GP
Die Area Scaling:	Better than industry 28/22 nm technologies
Analog/RF Design:	Wide range of advanced analog/RF devices
Ease of Design:	Extensive use of single patterning
Die Yield:	High yield with use of proven 22/14 nm features
Platform Readiness:	Industry-standard PDK0.5 now, PDK1.0 in Q2'17
Production Readiness:	Q4'17

22FFL is an exciting new technology that provides a compelling combination of performance, power, density and ease of design for low-power IoT and mobile products.

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